Amendments to the Specification:

Please replace paragraph 0039 on page 16, with the following amended paragraph:

[0039] Each waveplate 410 or 420 has a limited operating range. Each single waveplate 410 or 420 may be replaced by two or more identically oriented waveplates to expand the operating range for each orientation. FIG. 4B shows one example where two waveplates 410 and 412 at 0 degree are sequentially placed in the optical path before two waveplates 420 and 422 at 45 degrees. Hence, the device in FIG. 4B has twice the tuning range as the device in FIG. 4C. Certainly, 3 or more waveplates may be added to further expand the tuning range. This design avoids a conventional 4-element design where the elements are sequentially arranged as 0 degree, 45 degrees, 0 degree, and 45 degrees and can **simplify** ~~simplifies~~ the control operations.

Please replace paragraph 0048 on page 21, with the following amended paragraph:

[0048] The system 600 in FIG. 6 also exhibits several other characteristics. For example, the cover range on the sphere depends on the input polarization state. Since we already rotated the coordinates, all the linear polarization states that **lie** ~~locate~~ on the equator can be covered unless some elliptical or circular polarization states are required which is rarely the case. Also, the traces of the second PZT are parallel to each other for different V_1, however, there is no apparent relation between the traces of the first PZT as we change V_2. The only confined factor is the size of these traces that also depend on the input polarization states.

Please replace paragraph 0049 on page 21, with the following amended paragraph:

[0049] The first approach is using **feedback** ~~feed back~~ control after we gather the output SOP and compare with the desired one. Here all the connections through the paper are polarization maintaining or free space oriented. Since we know the trace of the second PZT that is parallel or coincide with the equator (after coordinates rotation using quarter wave plate), we can first try to move the output SOP from the initial state to a state on the equator ($s_3 = 0$) by changing the control voltage of the first PZT.

Please replace paragraph 0050 on page 22, with the following amended paragraph:

[0050] Here the factor of 0.30 is selected as an example ~~here~~ and may ~~be~~ need to be **adjusted** ~~adjust~~ for different products, i.e. related with half wave voltages.

Please replace paragraph 0051 on page 23, with the following amended paragraph:

[0051] FIGS. 10, 11, 12, and 13 are the flow charts for the control operations for the system 600 in FIG. 6. The control circuit 620 may include a digital signal processor or a microprocessor that is programmed with the control logics in FIGS. 10-13. The direction of V2 should consider the sign of s_1' and the characteristics of the squeezer (the relationship between increasing voltages and polarization rotation[[~~.~~]]), the same consideration may be applicable to all control operations.

Please replace paragraph 0052 on page 23, with the following amended paragraph:

[0052] FIG. 10 shows the main operation flow for controlling the system 600 in FIG. 6, where the value of "0.1" for d is an exemplary value for the tolerance limit. This tolerance limit may be set at other values according to the requirements of a specific application that employs the system 600, e.g., increasing the stability or tracking speed of the algorithm. FIG. 11 shows the initialization flow chart. Note ~~that Also,~~ **also that** the tolerance limits for s_3 and s_{31} in FIG. 11 are set at 0.1 as an example and may be set at other values to meet the requirements of the application. The selected values for the tolerance limits for s_3 and s_{31} may be different. In addition, the changes in the voltages for the iteration operations in FIG. 11 and other flowcharts in this application, such as $0.1V_{\pi 1}$, $\Delta V1$, $\Delta V2$, $0.25\Delta V1$, $0.75\Delta V1$, and $1.25\Delta V1$, may be set at different increments from the values illustrated. Selection of such values may be used to increase the stability or tracking speed of the algorithm. FIG. 12 shows the rough tuning flow chart referred in FIG. 10. In both FIGS. 11 and 12, if A of sin(A) is more than 1.0, just define θ_1 to be $\pi/2$, and the corresponding ΔV_1 be $V_\pi/2$-cos(1.2-A)*1.5 Volts. FIG. 13 shows the fine tuning flowchart referred in FIG. 10.

Please replace paragraph 0055 on page 25, with the following amended paragraph:

[0055] FIGS. 15A and 15B show computer simulated histograms for the 4-element implementation in FIG. 5B. For 100,000 independent samples, all the voltages of PZT1 (V1) and PZT2 (V2)(parallel to PZT1) are within [0,150]. As a comparison, FIG. 15C shows the computer simulated histogram for the 2-element implementation shown in FIG. 6 based on FIG. 5A. As shown, most of the voltages (V) are out of **range.** ~~range~~ .

Please replace paragraph 0063 on page 29, with the following amended paragraph:

[0063] FIG. 19 shows the operation steps in the feedback control in one implementation to control the multi-section polarization controller to find the desired output polarization state. The control operates on the first input section within the controller first and moves on to next in a sequential manner until all sections within the controller are optimized. FIG. 20 shows the operations in optimizing n-section of the polarization controller in the feedback system in FIGS. 17A and 17B.**[[**~~,~~**]]**

Please replace paragraph 0065 on page 29, with the following amended paragraph:

[0065] In implementation of the above control for the systems in FIGS. 17A and 17B, a reset-free operation may be achieved. As an example, detailed control for a six-stage fiber squeezer based polarization controller in FIG. 17B is described here. A rotatable waveplate driven by a step-motor may be used after the light source to perturb the input polarization state. The polarization stabilization unit is composed of a **six-axis** ~~six-axes~~ fiber squeezer polarization controller followed by a high-speed polarimeter. A voltage output from the polarimeter (i.e. corresponding to the optical power) is used as the feedback signal on the **six-axis** ~~6-axes~~ polarization controller. Thus by controlling the voltages on each stage of the polarization controller, we can maximize the feedback signal from the polarimeter.

Please replace paragraph 0068 on page 31, with the following amended paragraph:

[0068] Note there is another step that is not shown in the flowing chart. After tracking of all the six sections, another step may be added to increase the stability of the control algorithm. Here we use a dynamic procedure to find the section with a voltage that has **the largest different between** ~~the biggest difference with~~ the middle voltage (for our control circuit, this voltage is about 75 volts), and then load the reset algorithm to do the reset procedure to reset that section.

Please replace paragraph 0069 on page 31, with the following amended paragraph:

[0069] FIG. 22 shows the tracking algorithm for each section to optimize the amplitude of V1. By dithering the control voltage, we can decide the direction of voltage tracking. Also during this tracking, the voltage step may be changed to optimize the final output. For the reset requirement, if the section **needs resetting** ~~need reset~~, and it can be reset [[(]]since we track the six sections one by one, reset is not **guaranteed until** ~~guaranteed. Until~~ one section starts and finishes the tracking.[[, then it can start to test the opportunity for reset),]] **Next, this section can be tested to determine whether the reset algorithm is needed in order to avoid resetting this section and** then we follow the reset algorithm for that section **if the operating point of the section is too close to the upper or lower limit of the operating range**. If not, we fix the voltage of that section at either the upper or lower limit of the control voltage range. When a new cycle comes, this section can always decide the tracking possibility. E.g. if the section is at the lower limit, but increasing voltage can optimize V1, then the voltage will be increased, thus this section can depart from the limit and start efficient tracking again.

Please replace paragraph 0072 on page 32, with the following amended paragraph:

[0072] In some applications, system designers want to not only change the input SOP to the desired one, but also improve system performance such as reduction of crosstalk. For such kind of applications, a polarizer can be appended to the polarimeter by aligning its axis with one of the **Stokes** ~~Stokers~~ vector axes of the polarimeter, as shown in FIG. 24. In this configuration, the measured Stokes vector information (s_1, s_2, s_3) can be used as a rough feedback control signals on the first two control voltages of the four-stages fiber-squeezer based polarization controller. As the input SOP has been changed approximately to the desired state on the Poincare sphere, we can use the monitored optical power after the polarizer as feedback for fine-tuning on the other two control voltages. After the rough tuning using the first two PZTs of the polarization controller, we can use the detected optical power after the polarizer as the feedback signal to control the other two PZTs of the polarization controller for fine-tuning. The algorithm of this fine-tuning is just optimizing or maximizing the optical power after the polarizer. In this case, people always use dithering the control voltages to reach the optimum point. If the control voltages are dithered, the monitored power will change subsequently, thus the optimum point of the tracking is the maximum optical power output.

Please replace paragraph 0076 on page 35, with the following amended paragraph:

[0076] FIG. 29 shows a system for polarization scrambling assisted PMD compensation based on the above feedback control~~.~~, where fast polarization scrambling is **implemented** ~~implemetned~~ after the transmitter. In this scheme, the instantaneous DGD value can be obtained by the evaluation of the DOP information. At the output of the fiber link with PMD, the polarimeter monitors the variation of the polarization states including the DOP. The polarimeter acquires a given number (e.g. 100) of SOPs in millisecond time scale and **displays** ~~display~~ the measured SOPs on the Poincare sphere, where the DOP determines the length of a Stokes vector. The measured SOPs **form** ~~forms~~ an ellipsoid whose shape reveals information about the system's PMD and PSP. In a first-order PMD distributed system the DOP is equal to unity for input polarizations matching the PSP. The more the input SOPs differ from the PSP, the more the DOP is reduced, thus the measured output SOPs form an ellipsoid whose long axis has a length of unity and points into the direction of the PSPs. For the higher-order distributed systems, the ellipsoid's long axis is less than unity. In such kind of compensation scheme, a variable DGD element is required. Using the monitored information, including instantaneous DOP, SOPs (PSPs), we can always align the input PSP that points to the longest axis on the ellipsoid formed by the SOPs in a given time, with the intrinsic axis of the DGD element as described in the flow chart, while here the PSP is not derived from SOP information, but formed from the SOP distribution in a given time.

Please replace paragraph 0081 on page 39, with the following amended paragraph:

[0081] FIG. 34 shows a two-stage higher-order PMD compensator based on the above feedback control. A polarization controller followed by a fixed DGD element can handle the depolarization **component of** ~~component of~~ the second-order PMD, then a rotator followed by a variable DGD element will deal with the residual first-order PMD (part of them is induced by the higher-order compensator). Thus there are only two additional degrees of freedom compared with first-order PMD compensator using variable DGD.

Please replace paragraph 0085 on page 41, with the following amended paragraph:

[0085] FIG. 37A shows an in-line PMD compensator (GP-PMDC-1-1) using the above feedback control. The optical signal comes through the PMD compensator that is comprised of a polarization controller (PC) and a fixed DGD element (FDGD). The customers can choose their own feedback control signals, e.g. RF, DOP, etc. The module only has three control outputs for the polarization controller so that the polarization controller can change the state of polarization (SOP) of the input signal to align the fast and slow axes of the fixed DGD element with the slow and fast axes of the input signal distorted by PMD. To make the fixed DGD suitable for different bit **rates** ~~rate~~ or different fiber types, we choose a switchable DGD (a pseduo-fixed DGD) element with the DGD can be switched between 6 ps, 12 ps, 25 ps and 40 ps. ~~(~~Other values are also available for different applications~~)~~. Since the DOP of the signal will be decreased by the link PMD, in FIG. 37B(GP-PMDC-1), a polarimeter is added. This polarimeter may monitor the DOP of the input optical signal and can be used as feedback to control the polarization controller (PC) so that the DOP can be maximized, i.e. PMD can be compensated.